Hierarchical placement and network design problems

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Abstract:
Gives constant approximations for a number of layered network design problems. We begin by modeling hierarchical caching, where the caches are placed in layers and each layer satisfies a fixed percentage of the demand (bounded miss rates). We present a constant approximation to the minimum total cost of placing the caches and to the routing demand through the layers. We extend this model to cover more general layered caching scenarios, giving a constant combinatorial approximation to the well-studied multi-level facility location problem. We consider a facility location variant, the load-balanced facility location problem, in which every demand is served by a unique facility and each open facility must serve at least a certain amount of demand. By combining load-balanced facility location with our results on hierarchical caching, we give a constant approximation for the access network design problem

Index Terms:
approximation theory cache storage facility location file organisation hierarchical systems network synthesis resource allocation subscriber loops access network design problem bounded miss rates combinatorial approximation constant approximations hierarchical caching hierarchical placement layered caching scenarios layered network design problems load-balanced facility location problem minimum total cost multi-level facility location problem open facilities routing demand